FS-00496 (028890031AA)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of

Lawrence E. Albertelli	Appeal No.:
Serial No.: 09/695,873	Group Art Unit: 2614
Filed: October 26, 2000	Examiner: P. Natnael
Conf. No.: 2974	

For: IMAGE TEST TARGET FOR VISUAL DETERMINATION OF DIGITAL IMAGE RESOLUTION

Commissioner for Patents
United States Patent and Trademark Office
P. O. Box 1450
Alexandria, Virginia 22313-1450

BRIEF OF APPELLANTS UNDER 37 C.F.R. 1.192(c)

Sir:

Applicants have, on March 10, 2004, filed a timely Notice of Appeal from the action of the Primary Examiner in finally rejecting claims 1 - 12 in this application. Attached is a check in the amount of $330.00 (37 C.F.R. 1.17(f)) to cover the fee for filing this appeal brief.

REAL PARTY IN INTEREST

The real party in interest in this appeal is Lockheed Martin Corporation of 6801 Rockledge Drive, Bethesda, Maryland, assignee of the entire interest in the above-identified application.

RELATED APPEALS AND INTERFERENCES

The appellants, their legal representative and the assignee are presently unaware of any appeal or interference which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF THE CLAIMS

Claims 6 and 7 have been finally rejected under 35 U.S.C. §102 as being anticipated by Hibbs et al. (hereinafter "Hibbs") or Sussmeier.

Claims 1 - 7 have been finally rejected under 35 U.S.C. §103 as being unpatentable over Harshbarger, Jr., et al. (hereinafter "Harshbarger").

Claims 8 - 12 have been finally rejected under 35 U.S.C. §103 as being unpatentable over Sussmeier in view of Neyman.

No claims have been allowed. There are no outstanding matters of form in regard to the claims or any other part of the application.

No indication of any possible modification of any of these grounds of rejection is provided in the Advisory Action mailed February 25, 2004. It is therefore believed that the foregoing represents the current status of the claims.

STATUS OF AMENDMENTS

All amendments submitted prior to the Amendment under 37 C.F.R. 1.116 filed January 26, 2004, have been entered. The Advisory Action mailed February 25, 2004, does not indicate refusal to enter the amendment filed

January 26, 2004, and fails to indicate whether or not the amendments would be entered for purposes of Appeal. Similarly, the Advisory Action mailed February 25, 2004, does not respond to the arguments presented in the amendment of January 26, 2004, that the finality of the office action of December 29, 2003, was premature and should be withdrawn, as requested therein. Therefore, it is unclear on the record whether or not the amendment filed January 26, 2004, has been entered.

However, it is respectfully submitted that the amendment of January 26, 2004, was confined to the addition of hyphenation in the term "sub-field" in claims 2, 3, 9 and 10 for consistency with the specification and independent claims 1 and 6. Therefore, it is again respectfully submitted that such amendments cannot raise any substantive new issues and, in fact, reduce potential issues (since the inconsistency was not noted by the Examiner) on Appeal and, as such, should have been entered.

In view of this ambiguity of the record, the hyphenation proposed in the amendment of January 26, 2004, is underlined, as presented in that amendment, in the copy of the claims on Appeal in the Appendix of this Appeal Brief. In any case, since the requested amendments are clearly not substantive, entry or non-entry should have no bearing on the substance of this Appeal or the question of propriety of any of the various grounds of final rejection of the claims.

SUMMARY OF THE INVENTION

The invention is directed to a method for determining resolution of an optical system and a test target usable in that method. Since modern electronic imaging devices use a sensor, such as a charge coupled device (CCD), having discrete areas which develop a signal corresponding to energy incident thereon, the resolution of an optical system is limited by the size and pitch of such discrete areas. The invention provides a rapid and simple technique of determining a match between the spatial frequency of features 22, 24 of an object 20 referred to the image plane 30 of the optical system or camera and the spatial frequency of the energy-sensitive areas 32 of the image sensor 34 of that optical system or camera which limit the resolution of such features. Thus the preferred target object, as shown in Figure 3, provides a plurality of sub-fields having a *progression* of size and pitch which *encompasses* the resolution of the imaging system as referred to the object plane of the imaging system. If the spatial frequencies of the projected object features 50, 52 and the sensor areas 32 do not match, a Moiré pattern including one or more apparent bands or Moiré fringes which are readily perceptible by the eye is produced in the image resulting from the sensor output but such a Moiré pattern is absent when the spatial frequencies match each other and is imaged as a gray tone or as features at reduced or full contrast. The spatial frequency in the bands of the Moiré pattern will increase with the mismatch of spatial frequency between the object features and the discrete sensor areas and will assist in locating a sub-field of the image in which no Moiré pattern is produced. A sample of the image produced in

this manner and an enlarged portion thereof are provided in Figures 4 and 5, respectively.

As pointed out in response to the final rejection, page 11, line 15, to page 12, line 22, of the specification provides a concise description of the operation and principles of the invention. Page 11, lines 31 - 36, in particular, state:

> "In other words, the Moire' pattern as produced in accordance with the invention may be considered as a beating of different spatial frequencies with the frequency of the beating diminishing with diminishing difference of spatial frequency."

That is, in accordance with the invention, a Moire' pattern is developed in accordance with a difference of spatial frequency of image features in respective sub-fields of the imaged target as projected onto the image plane of the image capture device and the spatial frequency of the individual sensor areas (pixels) of the imaging device (e.g. a two-dimensional charge coupled device); the latter limiting the resolution of the image capture device, as illustrated in detail in Figures 1 and 2A - 2F and discussed on pages 6 - 10.

Further, in accordance with the invention and the preferred target, when the range of spatial frequencies of features of respective sub-fields 60 of the target, as referred to the image plane, *encompasses* (e.g. includes pitches/spatial frequencies of features both greater than and less than the pitch/spatial frequency of the sensors/pixels, a Moire' pattern will be produced in each imaged sub-field except for a sub-field where the spatial frequency of the features of the sub-field substantially matches the spatial frequency of the sensors/pixels, as illustrated in Figure 4 and in enlarged form in Figure 5

and discussed on pages 10 and 11 of the original specification. Moreover, the size and frequency of the Moire' fringes in each sub-field will lead the eye of a person inspecting the image of the target to the sub-field in which Moire' fringes are minimized or absent altogether, particularly where the size *and* pitch of features in the respective sub-fields form a *progression* which encompasses the resolution of the image capture device, thus not only allowing but facilitating a determination of resolution of an imaging device or system by simple direct inspection of the image produced/captured. Human readable indicia 62 associated with respective sub-fields of the target allows a direct quantitative determination of camera resolution from simple inspection or cursory viewing of the resulting image.

In practical usage, manufacturers of equipment employing optical image capture for any purpose must screen the image capture devices or cameras used, often in large numbers, to determine if the cameras will, in fact, capture the features of interest and quantify operating margins. The invention provides a rapid and simple technique to answer this need through cursory inspection of the image produced from a target having the characteristics of a plurality of sub-field where the image features in the respective sub-fields provide a *progression* of image feature size and pitch which *encompasses* the resolution of the imaging system as referred to the focal plane of the imaging system.

ISSUES

1. Whether or not the subject matter of claims 6 and 7 is anticipated by Hibbs et al. or Sussmeier under 35 U.S.C. §102.

2. Whether or not the subject matter of claims 1 - 7 is obvious in view of Harshbarger, Jr., et al. under 35 U.S.C. §103.

3. Whether or not the subject matter of claims 8 - 12 is obvious in view of Sussmeier and Neyman under 35 U.S.C. §103.

GROUPING OF CLAIMS

Claims 10, 11 and 12 are believed to stand or fall with claims 8, 9 and 6, respectively. However, the remainder of the rejected claims do not stand or fall together. The reasons why appellants consider the rejected claims to be separately patentable are set out in the following section, entitled "ARGUMENT".

ARGUMENT

The Prior Art
Hibbs et al. - 5,508,803

Hibbs et al. is directed to monitoring lithographic resolution of an exposure of a gray scale image to determine exposure dose and which may include a feature of a critical size, the imaged size of which may vary with exposure dose (column 2, lines 36 - 41). The exposure may be calibrated such that the size of an imaged gray scale feature is indicative of the size of a critical feature (column 2, lines 44 - 50). Hibbs et al.

acknowledges the prior art Starikov mask for monitoring exposure which provides lines of *varying width* at a *constant pitch* which is *below* the resolution limit of the optical system (and a single instance of a center region having a doubled width/pitch which is intended to reduce sensitivity to focus errors - see column 3, line 55 to column 4, line 5) such that each line will be imaged as a gray scale level in a "single, broad, diffuse line with linearly varying optical intensity on each side of the center 16". Hibbs et al. further indicates (column 4, lines 5 - 18) that the Starikov mask is essentially obsolete at current resolution capabilities because finer line widths and pitches are required to remain below the resolution limit of the optical system while a high degree of precision of the line width and spacing must be maintained to provide accuracy of the illumination when the lines are imaged as gray scale levels. These requirements can only be met, if at all, at substantial increase of difficulty and cost in mask fabrication and inspection.

Therefore, the mask proposed by Hibbs et al. consists of a plurality of bands or regions of respectively varying transparency which will be imaged as gray scale levels regardless of optical system resolution. By the same token, the width and pitch of each region in the Hibbs et al. mask is *purposely made non-critical*. Nevertheless, the pattern of region width/pitch in each of the preferred Hibbs et al. masks follows the width/pitch *pattern* of the Starikov mask: a *constant pitch* with a *single instance* of a region of a *multiple* of the width/pitch of the other regions.

Sussmeier - 5,760,829

Sussmeier is directed to evaluation of the critical optical parameters of an imaging device including a charge coupled device. For this purpose, Sussmeier provides a *plurality* of test targets, each directed to one or more particular critical optical parameters of the sensor. The captured image of each of the test targets is analyzed by a computer 35 rather than by inspection of a display of the captured image (which, in any event, would include image reproduction errors).

The test target of Figure 2 is used to evaluate dynamic range and three test targets are preferably provided at different imaging distances. As noted at column 5, lines 56 - 61, "[a]ll three test targets include twenty *equal sized* regions that are arranged in a two-dimensional array. Each region contains six *equal sized* zones having different *gray scale values*. The zones range from pure black to pure white with four equally spaced gray scale values in between." (emphasis added). In the following paragraph, Sussmeier notes that the depiction of Figure 2 "is intended to indicate the relative size an position of the *regions* and *zones* , and *does not accurately depict the appearance of the intermediate gray levels*" (emphasis added).

The test targets of Figures 3 and 4 are used to measure contrast resolution and distortion of the imaging device. The width and spacing of the black bars which extend across the entire imaging field are "*equal* and correspond to *the minimum feature size that the preferred imaging device is expected to resolve*" (column 6, lines 32 - 34 - emphasis added) in the respective vertical and horizontal directions. While exemplary dimensions of the lines and spacings are given, it is unclear if these

dimensions, when referred to the focal plane of the imaging device, are *equal* to the sensor area pitch and it is believed to be significant that Sussmeier does not appear to mention the target positioning criticality which would occur if that were the case (e.g. an image at any level of contrast including uniform gray could be produced depending on a shift of target position comparable to the spacing of the black bars). In any case, the array of black bars extends across the entire image field and is of constant pitch; both of which are appropriate to computerized analysis (rather than inspection) of the resulting image.

Harshbarger, Jr., et al. - 5,351,201

Harshbarger, Jr., et al. (hereinafter Harshbarger) is directed to evaluating the degradation of image reproduction by a display device (rather than an image sensor device). Test patterns, of which Figures 4A - 4J are "representative" (and which may have codes embedded in the image to indicate the test being run), are displayed on display device 22 and the displayed image captured by camera 26 which may be provided in a hand-held unit. The testing is performed on a pass/fail basis for each test. As with Sussmeier, the captured image is evaluated by computer (e.g. column 7, lines 60 - 62) rather than inspection. Several test patterns can be combined into the display area under test to provide more rapid testing (column 10, lines 14 - 20).

Figure 4F is a resolution pattern apparently similar to Figures 3 and 4 of Sussmeier. Figure 4H in a "Video pattern screen" (about which nothing else is said in Harshbarger) which consists of (from left to right) four black bars of a first width and pitch, two black bars of

differing width and framing a white bar of apparently the same width and two black bars of a second width and pitch. All of these features appear to be of a greater size and/or pitch than the features of the resolution pattern of Figure 4F and, in any event, all features of both Figures 4F and 4H must be resolvable by the camera 26 in order to carry out the intended tests.

Neyman - 5,917,987

Neyman is directed to a system for controlling image integrity when a previously captured image is transferred from one medium to another, such as from film to video tape. This system employs a control chart such as that illustrated in Figure 4 which includes bar-shaped areas of different color, gray scale levels, etc. The gray scale level areas of Figure 4 include human-readable, numerical values.

The Claimed Invention

Claims 1 - 5 are directed to a method or measuring resolution of and imaging system. Claims 6 - 12 are directed to a preferred target for use in the method.

The method as recited in claim 1 comprises three steps of 1.) imaging a target including a plurality of *sub-fields* which respectively provide a *progression* of image feature size and pitch *encompassing* the spatial resolution of the imaging system, to produce a captured image, 2.) *inspecting* the captured image for *presence or absence of Moire' patterns*, and 3.) determining resolution of the imaging system from feature size and pitch *in respective sub-fields*. Claim 2 additionally recites that resolution determination is made from a sub-

field having a minimum of Moiré fringes. Claim 3, also depending from claim 1 recites that the determination is made from a sub-field images as a uniform gray sub-field as may occur as illustrated in Figure 2E. Claim 4 additionally recites determining alignment from the apparent angle of a Moiré fringe (e.g. as may be observed in Figure 5. Claim 5 is directed to the additional step of forming the target by printing the claimed sub-fields and features therein on a computer-connected printer.

Target claims 6 recites the purpose of the target in the preamble thereof and, in the body of the claim, recites that the target includes 1.) a *plurality of sub-fields*, 2.)respective sub-fields include a *plurality of features*, 3.) the plurality of features of respective sub-fields provide or have a *progression* of image feature size and pitch and 4.) that the progression of image feature size and pitch *encompasses* the spatial resolution of the imaging system, as referred to an object plane of said imaging system. Claim 7 defines the features as lines and spaces. Claims 8 and 9 recites additional indicia included in the target and corresponding to resolution of feature size and pitch, respectively. Claims 10 and 11 define the additional indicia as a human readable number and which differ by dependency. Claim 12 is directed to provision of both numerical indicia and other indicia (e.g. arrows indicating the direction of the progression).

The Examiner's Application of the Prior Art

The Examiner asserts that Hibbs et al. anticipates claims 6 and 7. The Examiner asserts that Hibbs et al. teaches inspection of sub-fields of an image of a target for Moiré patterns and asserts that the spatial resolution is *encompassed* by the spatial frequency of target image features *because* "the pitch is chosen ... to be *below* the resolution of the lithographic exposure tool. In regard to claim 7, the Examiner asserts that the recitation of lines and spaces is met by Figure 1 of Hibbs et al., notwithstanding the commentary in the Advisory Action that Starikov is not applied against the claims while Figure 1 of Hibbs et al. is explicitly disclosed to be a Starikov mask from which Hibbs et al. teaches away by providing areas of partial transparency.

The Examiner also asserts that claims 6 and 7 are anticipated by Sussmeier using substantially the same rationale in regard to claim 6 as asserted in regard to Hibbs et al. However, the Examiner now suggests that the spatial resolution of the imaging system is *encompassed* in Sussmeier *because* the *dynamic range* and *contrast* are being determined in Sussmeier.

In rejecting claims 1 - 7 under 35 U.S.C. §103 as being unpatentable over Harshbarger, the Examiner asserts that a progression of feature sizes and pitches is met by the imaging target of Figure 4H of Harshbarger and that inspecting the captured image is met by adjustably mounting the camera and analysis either manually or by computer. The Examiner admits that Harshbarger does not teach or suggest determining resolution of the imaging system from feature size and pitch by inspecting the sub-fields but take official notice that it is well-known for an operator to inspect an image for other artifacts. In

regard to claims 2 - 4, 6 and 7, the Examiner merely refers to the official notice in regard to Moiré fringes as to which recitation in claim 1, the statement of the rejection is silent. In regard to claim 5, the statement of the rejection the Examiner suggests that the production of the target is met by printing a report.

In regard to claims 8 - 12, the Examiner asserts that Sussmeier teaches all claimed subject matter except for additional indicia on the target and applies Neyman for such a teaching. The statement of the rejection is silent in regard to the correspondence of indicia to feature size or pitch, as recited in claims 8 and 9, respectively. It is conceded that the numbers in Neyman are human readable and that other indicia are provided in Neyman and that claims 10 - 12 stand or fall with the claims from which they variously depend.

The Differences Between the Prior Art and the Claimed Invention

Before proceeding to a detailed discussion of the difference between the claimed subject matter and the prior art applied by the Examiner, attention is respectfully called to the Examiner's statement in the final rejection at page 10 (substantially repeated in the Advisory Action) that "applicant conveniently ignores the rejection as a whole and picks some words and terms to argue his point". It is respectfully submitted that such a statement is tantamount to an admission by the Examiner that the Examiner has not considered the claimed subject matter as a whole and has ignored explicit and salient distinguishing recitations of the claims while seeking to justify adherence to improper grounds of rejection, unsupported by the references relied upon, through a

rationale that the prior art is peripherally related to the invention and appears, in some way, to respond to the concept of the invention. It will be demonstrated below that such a rationale is not only improper in seeking to support grounds or rejection in which the teachings and/or suggestions of the prior art do not answer the claim recitations (or even the basic concept of the invention) but that it is factually incorrect, as well, and does not even recognize the physical phenomenon which the invention exploits such as the manner in which a Moiré pattern is developed as an interference pattern between arrays of differing spatial frequency (or even that a single line feature is incapable of producing a Moiré pattern on an array.

It is also respectfully submitted that the Examiner has not made the statements of the various grounds of rejection clear in regard to the portion of the teachings of the applied reference which is considered to correspond to the recitation of "sub-fields". This lack of clarity pervades all of the respective statements of the various grounds of rejection. As claimed, the target must include a plurality of features and the plurality of features must differ in size and pitch over the plurality of sub-fields and the respective sizes and pitches must "encompass" the resolution of the sensor device, referred to the object plane and, in combination with the spatial frequency of the sensor areas the features of the respective sub-fields must be potentially capable of causing a Moiré pattern if the pitch of the features does not match the spatial frequency of the sensor areas. These relationships and, indeed, the production of Moiré patterns or fringes is glossed over, ignored or confused with other features throughout the various statements of the grounds of rejection at issue in this Appeal.

Specifically, in regard to the rejection of claims 6 and 7 as being anticipated by Hibbs et al., the Examiner relies on a *single* central region being of double width in combination with other areas being of constant width or pitch answering the recitation of the features forming a *progression encompassing* the resolution of the sensor device notwithstanding the Examiner's assertion that the width of all of the features of the Mask of Hibbs et al. (or Figure 1 - the Starikov mask) are of a pitch chosen to be *below* the resolution of the lithographic system. However, it is respectfully submitted that even if such an assertion were not illogical and self-contradictory, if the plurality of sub-fields are taken to be regions 22, 84, 86, 88, 20, etc. each sub-field is then of a homogeneous, featureless gray scale level. If the spacing/widths of these regions are considered to be the "features" Hibbs et al. teaches only one sub-field having a constant pitch for all but the central area and the singular central area being incapable of providing (in combination with another array) a Moiré pattern or fringe corresponding to that width. Even if a plurality of such larger regions are provided, Hibbs et al. does not contain any teaching as to a spacing thereof which could prove a Moiré pattern or fringe and, moreover, Hibbs et al. does not teach derivation of a Moiré pattern or fringe even from the evenly spaced areas. In short, there appears to be no way that the teachings of Hibbs et al. can be consistently interpreted in a manner which answers the recitations of claim 6 and the Examiner has not suggested any such consistent interpretation. In regard to claim 7, the Examiner refers to the lines of Figure 1 which are also at a constant pitch (but varying width to produce a gray scale exposure dose), there is only one feature per sub-field (which, as a single

feature, would be incapable or forming a Moiré pattern or fringe) or, if the Starikov mask is considered as a single sub-field, there is no teaching of a plurality of sub-fields much less having features of differing size or pitch or *encompassing* the resolution of the optical system. Therefore, it is respectfully submitted that claims 6 and 7 are not, in fact, anticipated by Hibbs et al. and, moreover, the Examiner has not made a *prima facie* demonstration of the propriety of such a rejection.

In regard to Sussmeier and a similar rejection of claims 6 and 7 for anticipation, while Sussmeier is at least directed to testing an image sensor, the recitation of a plurality of sub-fields can be read on the regions and zones of Figure 2 but not the homogeneous patterns of Figures 3 and 4 (e.g. generally parallel to the ambiguity in regard to sub-fields in Hibbs et al.) The regions of Sussmeier are equal in size and the zones in the respective regions are also featureless, homogeneous gray scale levels and of equal, constant size and pitch. The hatching of Figure 2 explicitly does not indicate features in any zone of that target. The line patterns of Figures 3 and 4 are not arranged as a plurality of sub-fields but are single patterns of constant line width and pitch and are either resolved or not as a criterion of the test and thus cannot "encompass" the resolution of the optical system. Therefore, it is clear that Sussmeier cannot be consistently interpreted in a manner to answer all the explicit recitations of the claims and the Examiner has not proposed any interpretation that would successfully do so. Therefore, no *prima facie* demonstration of anticipation of claims 6 or 7 by Sussmeier has been or can be made and Sussmeier does not, in fact, anticipate any claim in the application.

In summary, neither Hibbs et al. nor Sussmeier anticipates claim 6 or 7 because nether contains any teaching answering "a plurality of sub-fields" consistent with "respective sub-fields including a plurality of features" consistent with "said plurality of features of respective sub-fields of said plurality of sub-fields having a *progression* of image feature size and pitch *encompassing* the spatial resolution of said imaging system, referred to an object plane of said imaging system. Neither Hibbs et al. nor Sussmeier teaches (or remotely suggests) the development of Moiré patterns, much less with a target having sub-fields with features in respective sub-fields *progression* of feature sizes and pitches *encompassing* optical system resolution.

In regard to the rejection of claims 1 - 7 as being obvious over Harshbarger, the Examiner admits that Harshbarger does not teach determining resolution by inspection of size and pitch (while the claims recite inspection for *Moiré patterns* rather than for size and pitch and the statement of the rejection does not answer the claim recitations for that reason, as well). However, the Examiner does not seem to appreciate the significance of such a deficiency of Harshbarger. If Harshbarger does not teach determination of resolution by inspection of an image for Moiré patterns or fringes produced from a target constituted as recited in the claims, Harshbarger cannot lead to an expectation of success in doing so as recited in the claims and thus can provide no evidence of a level of ordinary skill in the art that would support the conclusion of obviousness that the Examiner has asserted. Moreover, while official notice might be properly taken that an image might normally be inspected by a user of the system of Harshbarger (notwithstanding the fact that the image

analysis is done by computer or the fact that Harshbarger is directed to the analysis of the quality of the *target* as produced by display 22 rather than the quality of image *capture* by camera 26), official notice, as taken by the Examiner, does not extend to inspection for Moiré patterns or fringes and cannot properly extend to such, particularly where no Moiré patterns are suggested to be produced by Harshbarger. Furthermore, to properly evaluate the displayed image, the resolution of camera 26 of Harshbarger should have a resolution such that Moiré patterns *would not be produced* since such an artifact would be attributable to the measurement system and not to the display being tested. In this respect, Harshbarger teaches directly away from the present invention. Therefore, by failing to address such issues or other deficiencies of Harshbarger such as its basic intended purpose or how Moiré patterns could be produced consistent with that intended purpose or any teaching of a plurality of sub-fields having features forming a *progression* of size and spacing which *encompasses* the resolution of the optical system, the Examiner has failed to make a *prima facie* demonstration of obviousness of any claim in the application and the rejection, as stated, is clearly seen to be in error for failing to address explicit recitations of the claims and as being unsupported by the reference and/or official notice, properly take, relied upon. Accordingly, it is respectfully submitted that claims 1 - 7 are not, in fact obvious over Harshbarger.

In regard to claims 8 - 12, it is respectfully submitted that the statement of the rejection is in error and does not make a *prima facie* demonstration of obviousness as to at least claims 8 and 9 since the statement of the rejection is silent at to the

correspondence of the numerical indicia of Neyman being related in any way to size of pitch of features of a sub-field. Neyman does not supplement Harshbarger or any other reference in regard to features in sub-fields since the indicia in Neyman are directed to reflectivity or transparency of otherwise featureless, homogeneous sub-fields. Therefore, the Examiner is again seen to have ignored explicit recitations of at least claims 8 and 9 and thus failed to make a *prima facie* demonstration of obviousness of those claims. Moreover the Examiner has not demonstrated how any of the other deficiencies of Sussmeier, discussed above, are in any way mitigated by the teachings of Neyman or evidence of the level of ordinary skill in the Art provided by Sussmeier that could support a conclusion of obviousness. Again, it is respectfully submitted that Sussmeier does not teach or suggest the formation of Moiré patterns by a *progression* of size and pitch of features in respective sub-fields which *encompasses* the resolution of the optical system. Accordingly, it is respectfully submitted that claims 8 - 12 are not, in fact, obvious over Sussmeier in view of Neyman and at least claims 8 and 9 are separately patentable from the claims from which they depend.

CONCLUSION

In summary, it has been demonstrated that each of the four separate grounds of rejection stated by the Examiner are clearly in error and that a *prima facie* demonstration of the propriety of any of the stated grounds of rejection has not been made. The Examiner has effectively ignored or otherwise confused major explicit and distinguishing features clearly and unambiguously recited in the claims. Therefore, reversal of the

Examiner as to each of the grounds of final rejection is respectfully requested.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,

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APPENDIX

THE CLAIMS ON APPEAL

The claims on appeal are as follows:

1. A method of measuring resolution of an imaging system, said method comprising steps of

imaging a target including a plurality of sub-fields, respective sub-fields of said plurality of sub-fields providing a progression of image feature size and pitch encompassing the spatial resolution of said imaging system, to produce a captured image,

inspecting said captured image for presence or absence of Moire' patterns in sub-fields of said captured image, and

determining resolution of said imaging system from feature size and pitch in respective sub-fields inspected in said inspecting step.

2. A method as recited in claim 1 wherein said determining step determines resolution from a sub-field pattern having a minimum of Moire' fringes.

3. A method as recited in claim 1 wherein said determining step determines resolution from a sub-field imaged as a uniform gray sub-field.

4. A method as recited in claim 1, including the further step of

determining alignment of said imaging system from Moire' fringe angle in sub-fields inspected in said inspecting step.

5. A method as recited in claim 1 including the further step of

printing said target on a printer connected to a computer.

6. A target for determining resolution of an imaging system by inspecting an image of said target for Moire' fringes in respective sub-fields of an image of said target, said target including

a plurality of sub-fields, respective sub-fields including a plurality of features, said plurality of features of respective sub-fields of said plurality of sub-fields having a progression of image feature size and pitch encompassing the spatial resolution of said imaging system, referred to an object plane of said imaging system.

7. A target as recited in claim 6, wherein said features include lines and spaces.

8. A target as recited in claim 6, further including indicia indicating a resolution corresponding to feature size of features in a sub-field.

9. A target as recited in claim 6, further including indicia indicating a resolution corresponding to pitch of features in a sub-field.

10. A target as recited in claim 8, wherein said indicia is a human readable number.

11. A target as recited in claim 9, wherein said indicia is a human readable number.

12. A target as recited in claim 6, including reference numbers corresponding to resolution of said imaging system and a further indicia.